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THE INDEPENDENT RESEARCH AND DEVELOPMENT PROGRAM. A REVIEW OF IR AND D

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OFFICE OF THE DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING

THE INDEPENDENT RESEARCH & DEVELOPMENT PROGRAM

A REVIEW OF IR&D

as reported to

The IR&D Policy Council

by the

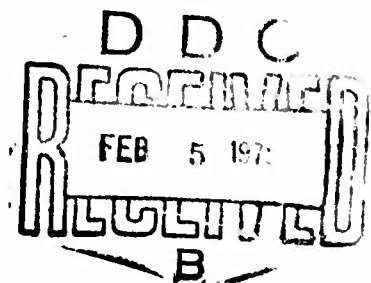
DoD Working Group on Nature, Objectives

and Effects of the

Independent Research and Development Program

June 1974

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FOREWORD

In September 1971 the Department of Defense Independent Research and Development (IR&D) Policy Council directed the organization of a Working Group to provide for the Council a concise definition of IR&D - what it is, what its objectives are (as seen by the Department of Defense, other Government Agencies, and industry), its accomplishments, its deficiencies, and any impediments to the future realization of its defined objectives. In December 1972 the Working Group produced a report in response to its assigned task. During its preparation extensive interviews were conducted with government and industrial executives directly involved with the management, evaluation, and utilization of IR&D work. The information and viewpoints thus obtained were reflected in that report, together with the judgment of the Working Group members. The report was presented to the IR&D Policy Council in early 1973 and thereafter distributed widely to interested government and industrial activities.

The present report is an updating revision of the 1972 report. It should be recognized that this report highlights points of special interest, but in no way is intended to be a complete description of DoD policies, practices and procedure in the IR&D area.

DoD Working Group on Nature, Objectives and Effects
of the Independent Research and Development Program

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THE INDEPENDENT RESEARCH & DEVELOPMENT PROGRAM

A REVIEW OF IR&D

WHAT IS IR&D?

1. What types of work are performed as Independent Research and Development (IR&D)?

IR&D is contractor performed, product-oriented research and development that is not sponsored by contract, not required in the performance of a contract or grant, and not required for the preparation of a specific bid or proposal. The categories of tasks performed with IR&D funds are basic research, applied research, concept formulation studies, and product development. The first three of these categories have relatively narrow definitions. The development area, however, is very broadly defined. It includes not only the design, breadboarding or prototyping, test and evaluation of new systems and components, but also improvement efforts directed toward existing systems and components.

IR&D may be work with a direct or very close association to DoD directed programs, or it may relate to tasks primarily directed toward the needs of a non-DoD customer. It can be a long-range effort to improve the state-of-the-art, or it may be a very short-range effort.

IR&D is a normal cost of business for all companies irrespective of whether they do business with the DoD or not. National Science Foundation estimates industry expenditures for IR&D to be \$12.4B. The major DoD contractors account for only about \$700M of that amount.

2. What types of work are performed as Bid and Proposal (B&P)?

B&P costs are costs incurred in preparing, submitting and supporting bids and proposals, whether these proposals are directed toward government or non-government contracts and whether they are successful or not. Two general types of efforts are performed with B&P funds. First, there is administrative effort directed toward physically preparing the proposal document, and assembling the cost and other administrative data necessary to support the proposal. Second, there is technical effort which is undertaken specifically to support a contractor's bid or proposal. This technical effort may include work with the same characteristics as IR&D. It may also include efforts such as development of manufacturing and production engineering data and production schedules.

3. How do IR&D and B&P technical work relate?

The major difference between B&P and IR&D technical effort is the presence or lack of intent to use the results directly for preparing a specific bid or proposal. IR&D generally precedes the related B&P. It is a longer-range effort, generally broader in scope than B&P, intended to lead to as-yet-unspecified future business. B&P effort involves the polishing of the results of technical effort begun under IR&D into a form suitable for a specific identifiable proposal or competitive bid. In some cases, B&P effort which is unsuccessful may be followed by IR&D to enhance the company's position for future competitions.

4. Are there other major areas of company indirect technical work which are not included in IR&D or B&P costs allocated to Government contracts.

Several types of indirect technical work are not generally included in IR&D or B&P, but are charged to other overhead categories. Examples are manufacturing and production engineering to improve current manufacturing methods (e.g. motion and time studies, tool design and improvement job analysis, efforts to solve specific production problems); engineering standardization functions (including establishing and maintaining manuals or files for drawing procedures, design practices, material specifications, etc.) and development of computer programs for routine use for multiple purposes. Calibration services, technical information services, training and education or such professional activities as attendance at professional meetings are not included in IR&D. Neither are such technical work as literature searches, inspection and testing of vendor products to determine suitability for intended use, market analyses and surveys, nor technical consulting expenses. Notwithstanding the foregoing, it must be understood that costs of the type illustrated may be included in IR&D or B&P projects if the effort is required in direct support of those projects.

5. What are the trends in types of work performed under IR&D?

One major trend in IR&D is an apparently widespread increase in emphasis on short range efforts, with a corresponding decrease in longer range basic and applied research. This trend appears to result from the current economic squeeze on DoD-oriented industry.

A second apparent IR&D trend is toward an increasing use of IR&D by prime contractors to develop capabilities which will reduce their dependence upon subcontractors to build subsystems and system components. This trend is most visible among the major aerospace contractors.

A third IR&D trend is toward carrying IR&D product development much further along in the development cycle than formerly. This trend is believed to be motivated by a DoD trend toward requiring much more proof of new technology and new component designs before adopting them for use in new systems.

6. What are the trends in IR&D and B&P costs and expenditures?

The cost per man-year of IR&D and B&P, like the cost of other services, is increasing. Costs per man-year vary over a wide range. A typical average for a company lies between \$30,000 and \$50,000 per man-year including overhead. Total IR&D and B&P expenditures appear to have decreased in 1970 and 1971 but increased in 1972. During 1973 there was a trend for contractors to increase their IR&D expenditures at the expense of B&P.

7. When, how, and why did the DoD begin reimbursing contractors for IR&D and B&P expenses?

Treasury Decision 5000 issued in 1940 recognized contractors' "indirect engineering" expense and Bidding and General Selling expense as allowable costs. A later document entitled "Explanation of Principles for Determination of Costs under Government Contracts", and known as the "Green Book", which superseded TD 5000, recognized contractors' "research, experimental and development" costs as allowable. Bidding expense was made allowable.

The first Armed Services Procurement Regulation cost principles were published in 1949. B&P costs were not mentioned but there is no reason to believe that these costs ever were considered unallowable. "Research and development specifically applicable" to contract work was established as allowable, but "general research" was to be unallowable unless the contract terms specifically provided for it. Many of the major contractors had such specific contract provisions and recovered all their costs of the type we now call IR&D.

In 1959, the existing IR&D and B&P cost principles were published. They remained unchanged until publication of Defense Procurement Circular 90, which began to affect contractors in January 1972. The 1959 cost principles identified Bid and Proposal costs for the first time and provided for them to be allowable, subject only to the general test of reasonableness. The term IR&D was also used for the first time, replacing "general research" and it too was made allowable. Deletion of the requirement for a special contract clause to make IR&D allowable was a change in policy. A warning was included in the cost principle, however, stating that IR&D costs should be "scrutinized with great care" and limited by advance agreements when appropriate.

8. What types of personnel participate in IR&D and B&P programs?

The technical, scientific, marketing and managerial personnel primarily concerned with IR&D and B&P programs are supported by a wide variety of others including draftsmen, machinists, contracting specialists (in the case of B&P), patent attorneys, etc. as required. The ratio of scientific and technical personnel to support personnel generally is higher for IR&D and B&P than it is for contracted work, because the absence of contractual relationships, or of need for detailed engineering specifications, production drawings, elaborate qualification procedures, etc. makes possible a primary focus of effort on applied science and advanced technology. Some technical specialists are assigned primarily, and more or less permanently, to IR&D tasks. Most, however, move back and forth between IR&D and contract work. It is not unusual for the specialists associated with a successful IR&D project to stay with it as members of the technical team supporting later development work under contract.

WHAT ARE THE OBJECTIVES?

9. What are the DoD Objectives?

The overall DoD intent in supporting IR&D is to encourage the evolution and maintenance of a strong, up-to-date and creative technology-based industry, from which DoD can draw - as needed - both new concepts and rapid responses on a competitive basis to meet its requirements. Specific objectives supporting this overall intent include:

- Accessibility of technically qualified contractors willing and able to compete for technically oriented DoD contracts.
- Reduced costs, through availability of competitive technical options for filling operational needs.
- Superior military capabilities derived from competitive technical options originated by IR&D work.

Private companies that provide technically based products and services, whether for DoD or for commercial customers, must maintain active in-house R&D programs if they are to sustain a continuing ability to respond with minimum delay to changes in customer needs. From the DoD point of view, the IP&D support for such programs in industry complements contract-supported R&D aimed at improving the technology base. Through IR&D support the DoD solicits DoD-oriented technological innovation throughout industry, and thus need not rely solely on DoD personnel to initiate and judge original exploratory effort.

10. Do DoD objectives differ by type and size of industry or type of contract?

The DoD objectives for IR&D, as outlined above, do not vary, either by type of industry or by size of company. The size of each company's IR&D program and the diversity of its program normally correspond to the needs and capabilities of the sponsoring company, as decided by company management. Thus, company objectives may differ widely. DoD evaluation of the worth of various company programs, of course, may also differ widely. The DoD objectives, however, do not differ from company to company nor from industry to industry. The basic objectives of IR&D are not affected by the type of DoD contracts prevailing at a company.

11. Have DoD objectives changed over the years?

The basic DoD objectives for IR&D have not substantially changed over the years. For example, the earliest documented references to IR&D are contained in the "Green Book," a document entitled: "Explanation of Principles for Determination of Costs Under Government Contracts," which was published by the War and Navy Departments in April 1942. At that time IR&D was referred to as "engineering and development expense." It was defined as satisfying the same basic objectives stated above. Although not a change in objectives, a gradual evolution has taken place toward increased utilization of IR&D-generated information by the R&D personnel in the DoD.

12. What are the objectives of other Government agencies?

a. NASA: NASA objectives relative to IR&D and B&P have been to encourage advanced technology in aeronautics and space; to support the existence of a viable technological and industrial capability; to maintain the essential independent character of IR&D and B&P activity; and to cooperate with the DoD in the establishment and administration of controls over IR&D and B&P activity. NASA's future objectives will probably remain similar to these.

b. AEC: In the Atomic Energy Commission there is no independent research and development work in contracts for the operation of government-owned facilities. When work is performed in contractor-owned facilities, the AEC participates in the IR&D costs to the extent the IR&D projects benefit the contract work either directly or indirectly. Such benefit generally consists of help in advancing the state-of-the-art in the field of the contract work, or in advancing technology closely related to such fields. The ultimate supposition is that IR&D support should result in reduced costs, improved methods or new inventions directly relevant to the area in which the contractor is performing work for the AEC. In 1972 the AEC accepted about \$1.5M in IR&D costs under these limitations.

Bid and proposal costs must be applicable to the AEC program to be allowed. No other definition is imposed but the AEC tightly controls B&P costs by imposing a limitation of 1% of direct material (exclusive of capital equipment) and direct labor costs of the contract work proposed. Benefits expected from the technical work allowed as bid and proposal costs are similar to those expected from IR&D.

c. DOT: The Department of Transportation does not have a Department-wide position on IR&D. The Coast Guard has little, if any, IR&D effort. The Federal Highway Administration disallows IR&D. The Federal Railroad Administration disallows IR&D. The Federal Aviation Administration reimburses IR&D to the same extent as the DoD, accepts the Tri-Service rates, and has the same objectives as the DoD.

WHAT ARE THE BENEFITS?

13. What benefits has the DoD obtained from IR&D? Have the DoD objectives been realized?

IR&D has been a major source of support for the building of technological strength, breadth, and depth among the DoD industrial contractors. The DoD has profited from this technology base in industry by obtaining from it original technical approaches, concepts and inventions, many of which have been applicable to DoD needs.

The industrial technology base developed and supported by IR&D has produced competitive technical solutions to DoD problems, among which the DoD has been able to select the best for further development. IR&D has proved to be a highly effective means for preliminary screening and evaluation of new technical concepts, permitting numerous approaches to difficult problems to be made with minimum formality, and eliminating all but the best of the approaches before contract support is required. The most "exploratory" parts of exploratory development apparently have been, in fact, done in large part by IR&D, and there is considerable body of opinion which holds that they have been done better than this sort of work would be done by formal contract, precisely because the R&D was "independent" and therefore not constrained by narrow official views of immediate needs or approved approaches to meeting of military requirement.

IR&D is a relatively uncomplicated process administratively. It has been, for this reason, a productive process for accomplishment of numerous essential "nuts and bolts" tasks of DoD technology development that are too small to be performed economically by contracting.

IR&D has been of direct benefit to DoD engineering, development and production contracts by providing alternative solutions to difficult technical problems -- solutions whose development could not be or was not funded by the contract itself. Availability of such alternate solutions reduces risk of technical failure or of a schedule slippage.

IR&D has helped maintain a useful degree of stability in the engineering organization of the DoD contractors, as contract requirements for technical manpower ebb and flow. This stabilizing effect of IR&D has helped assure that engineering skills are available for DoD efforts when they are needed.

Overall, it appears that the DoD objectives for IR&D have been reasonably well satisfied by the benefits obtained in actual experience.

14. What benefits have other government agencies obtained?

The benefits of IR&D to NASA have been similar to DoD benefits.

Since the AEC does not utilize IR&D in the same sense as the DoD and NASA, its benefits from contractor-initiated R&D are somewhat akin to those obtained by direct funding of contracts in response to unsolicited proposals by contractors, but without most of the administrative complications and expense.

15. What benefits have contractors obtained?

IR&D has been to DoD contractors an important source of support for development of competitive technological strength. Direct contract funding builds technical strength only in the areas of concern to the projects under contract. The strength to compete in new fields, or for major new tasks even in closely related fields, has been derived largely from IR&D.

IR&D activities retain and make effective use of key technical personnel as contract demands for their time ebb and flow. Some degree of stability among key personnel is essential for competitive, effective company operation. Good men cannot be kept "on a shelf" until needed. They must be employed on challenging and constructive work, and IR&D provides such work with benefit to the individual and to the DoD, as well as to the contractor.

Technical work allowable as B&P commonly is performed by contractors in direct support of bids and proposals for new contracts, and provides much of the technical substance that can lead to a winning proposal.

IR&D performed in parallel with a major engineering development or production contract has often provided new alternate solutions to difficult technical problems, to the benefit of the contractor, the DoD and the general state-of-the-art.

16. In what ways might the benefits of IR&D be maximized?

The predominant view expressed by industrial management, DoD procurement agencies and the Service System Commands is that the IR&D policy and system now in force in the DoD should be continued; that the present DoD policy and system are superior to any of the apparent alternatives; but that worthwhile improvements can result from better and more consistent DoD administration than has been the practice. Specific suggestions for administrative improvements include the following:

- Develop clear guidelines for the amounts and kinds of IR&D that will be supportable. Make these guidelines widely available to the involved government agencies and to industry. Within these guidelines allow the maximum freedom feasible for industrial IR&D users to determine for themselves the size and nature of their IR&D programs.
- Ensure that the DoD and the Services have adequate numbers of competent personnel assigned to review the IR&D program properly. Assure that they are well versed in the basic DoD policies for IR&D, and in the specific guidelines for their application.
- Develop uniform negotiation guidelines, criteria and policies for future use to aid in the consistent negotiation treatment of contractors. Assure that these operating policies are followed by all DoD negotiating teams.
- Publicize to DoD scientists, engineers, and program managers the nature of IR&D, how to obtain and utilize IR&D information, how to guard its proprietary nature, and the limitations on their control over IR&D technical efforts by contractors.

HOW ARE THE MECHANISMS FOR IR&D COST RECOVERY APPLIED?

17. How are IR&D costs recovered?

IR&D costs are recovered as a part of the indirect costs allocated to all contracts, both government and commercial, regardless of contract type. The amount of R&D recovered on DoD contracts is limited by advance agreements or by formula. In either case the portion of DoD work in the allocation base is a major factor. IR&D costs are generally accumulated in the G&A indirect costs pool and charged to an allocation base which the government agrees is equitable. Commercial and non-DoD government contracts bear their shares of the total allowable costs.

The impact of IR&D and B&P ceilings varies considerably depending on the types of contracts involved. A contractor whose business is oriented primarily to competitive firm-fixed-price work will hardly be affected at all. For a contractor having primarily cost-reimbursable contracts, a ceiling would have a very significant impact. Where DoD sales constitute a small fraction of his total, the contractor will not be sufficiently affected by a ceiling to give it much consideration in the management of his IR&D and B&P program.

18. How are IR&D costs limited?

Since the implementation of the new IR&D/B&P cost principles published in DPC 90, IR&D costs have been limited using the following techniques:

- Mandatory advance agreements with contractors recovering from the DoD more than \$2M in IR&D/B&P costs during the prior year.
- Ceilings determined by formula for contractors not required to negotiate advance agreements, where they are not Contractor Weighted Average Share (CWAS) qualified.
- Special provisions in individual contracts which limit or exclude IR&D, generally by making such costs allocable but not allowable.

19. What companies are required to negotiate an advance agreement?

Any company which received payments, either as a prime contractor or subcontractor, in excess of \$2 million from the DoD for IR&D and B&P in a fiscal year, is required to negotiate an advance agreement with the Government which establishes a ceiling for allowability of IR&D and B&P costs for the following fiscal year. Computation of the amount of IR&D and B&P costs to determine whether the \$2 million criterion was reached will include only those recoverable IR&D and B&P costs allocated during the company's previous fiscal year to all DoD prime contracts and subcontracts for which the submission and certification of cost or pricing data was required in accordance with Section 2306(f) of Title 10, United States Code. The computation will include full burdening in the same manner as if the IR&D and B&P projects were contracted for, except that G&A will not be applied.

20. What has been the effect of interchangeability of IR&D and B&P?

The interchangeability of IR&D and B&P does not appear to have caused any significant flow of funds from IR&D into B&P. In fact, several contractors have increased their IR&D programs at the expense of B&P during the past year. This appears to have been the result of delayed or cancelled procurements. In essence, interchangeability of IR&D and B&P has increased company management flexibility and does not appear to have resulted in excessive B&P activities as some had feared. Since IR&D and B&P are now interchangeable a major area of cost classification conflict has been mitigated. However, since a contractor might systematically shift low-rated IR&D projects into B&P to exclude them from the technical evaluation, in-plant surveillance of this area is still important.

HOW IS IR&D MANAGED BY CONTRACTORS?

(Note: The answers to the questions in this section of this report were derived from an on-site survey of the top managements of 30 major defense contractors conducted in May-June 1972. The survey entailed personal interviews by the members of our Working Group with engineering, marketing and financial Vice Presidents of the companies questioned. The composite results are presented in complete form in Appendix A of this report).

21. Historically what have been the most important factors in advancing the technical capabilities of the major defense contractors?

Management willingness to use Company resources in technical pursuits; good hiring practices and relative stability of technical employment; and performance of technically challenging contracts (in that order).

22. What role has IR&D played in advancing contractors' technical capabilities?

It has provided an opportunity to develop the technical capabilities of company research and engineering employees, and has been a fertile source of new concepts leading to R&D contracts from the DoD and NASA, with consequent entry to new technical fields. Virtually all of the companies interviewed support with company money IR&D beyond the ceiling levels accepted by the DoD for reimbursement. Their managements assert that they could not compete successfully without doing so.

23. How is the overall budget level for IR&D determined, and by whom?

In most companies the IR&D budget level is determined by general management at top levels, with supporting information and advice provided by engineering, financial, and marketing management (mentioned in that order of frequency). The major determinants are company financial status and policy, marketing needs, the engineering resources available in the company, and availability of government support.

24. How are IR&D projects selected, and by whom?

The primary role in project selection is played by engineering management, with advice from marketing, program management and sometimes the executive offices (especially when relatively large projects are undertaken). The most important selection criteria are a need for new technology to meet known or strongly anticipated specific engineering requirements; the probability of success; and the possibility of major technical breakthrough (noted in that order of importance). Potential projects develop also through contractor interface with the technical and planning staffs of the Services.

25. How are the DoD and other governmental agencies' requirements for new technical information ascertained so that they can be considered in planning the IR&D program?

Primarily by personal contacts with government people in their offices, and at meetings or seminars on relevant technical subjects. Government planning documents and statements of operational requirements are useful to a lesser extent.

26. How and for what reasons are changes, additions, or terminations of IR&D projects accomplished?

Program revisions of this sort generally are initiated and approved by engineering management. In the case of very large programs or programs of particular sensitivity, the executive general management may initiate or approve changes. The reasons for initiating changes most frequently mentioned are: (1) Very promising or very disappointing technical progress; and (2) Changed company marketing or business priorities. 80-90% of all projects initiated, however, are completed, more or less as planned. Three fourths of all IR&D projects are completed in a period between one and five years duration; only 10% have a lifetime longer than five years.

27. What is the usual output of an IR&D project?

Prototype hardware or other materials, and reports documenting the project and its results are nearly universal outputs. Most of the companies interviewed seldom apply for patents; fewer than 10% of IR&D projects result in patent applications. A small number of companies, on the other hand, follow the opposite policy and make patent applications on results of most of their IR&D projects.

28. Are there major weaknesses in current DoD administration of IR&D, as seen from the industrial contractors' viewpoint?

- 70% of those interviewed stated that there have been major weaknesses in the technical evaluations. Those so stating asserted that the technical evaluations have suffered from poorly selected and poorly prepared evaluators at the on-site surveys, from insufficient time and effort applied, from too rigid interpretations of relevancy requirements, from excessive emphasis on brochuremanship, and from failure to give adequate debriefing (feedback) to the contractors on the results of technical evaluation. Other complaints were mentioned less frequently. Despite these complaints, however, 80% of those interviewed consider the end result of each technical evaluation to have been fair and reasonable.

- 90% of those interviewed see major weaknesses in the current approach to IR&D negotiations. The most frequently mentioned concerns are: (1) A lack of firm criteria for negotiation. This situation permits government negotiators to place a company under extreme duress to accept whatever is offered; and (2) insufficient emphasis upon the technical merits of a contractor's IR&D program in determining his ceiling. Many of the companies also expressed a need for more freedom for normal business competitive pressures to determine an acceptable size and content for their IR&D programs, and for a more liberal interpretation of relevancy - making the requirement apply to "U.S. Government" rather than to the DoD alone.
- 65% of those interviewed felt that implementation of IR&D policy by lower DoD echelons distorted the policy to some degree. The most frequently mentioned complaints were that working level personnel tend to be unreasonably cautious and restrictive, and that contracting officers sometimes pressure contractors to support their contracts with IR&D. 35% of those interviewed, however, were satisfied that implementation of IR&D management has properly reflected DoD policies.

WHAT ARE THE IMPORTANT ASPECTS OF GOVERNMENTAL CONTROLS OVER IR&D?

29. Why are Governmental controls necessary?

Governmental controls are applied to assure maximum benefit to the Government from IR&D programs conducted with cost-reimbursable contracts, while assuring that the costs to the DoD remain reasonable. The legal requirement for controls appears to have a sound basis, although it is clear that the need of DoD contractors to keep their reimbursable costs at competitive levels also exerts a strong marketplace control.

30. How does the DoD control costs?

The DoD control over industrial IR&D program costs is exercised mainly through a determination of the reasonableness of these IR&D costs and, therefore, the extent to which they should be reimbursed. A secondary control is exercised through the technical evaluation process, which also determines to some degree the level of reimbursement. Contractors who meet a \$2 million threshold for IR&D or B&P must, by legislation, negotiate advance agreements for these costs while contractors below this dollar threshold generally will have the amount considered reasonable for allocation determined by formula.

31. What does the advance agreement procedure accomplish?

It enables and requires contractors to plan IR&D programs in advance of expenditures and to know approximately how many dollars may be recoverable. It clarifies the scope and type of effort considered applicable, thus reducing subsequent audit problems. It allows the DoD to negotiate a reasonable dollar ceiling with the contractor before costs are incurred, so as to exercise a dollar control over a substantial portion of IR&D costs. Part of the process of the advance agreement requires that a technical evaluation of the program be made. However, no attempt is made through this procedure to direct a contractor's program in terms of size or technical content. Obviously, the evaluation process does influence the contractor's thinking and his plans for the IR&D program.

32. What does the formula provide for smaller contractors?

The formula approach provides an automatic mechanism which assures uniform determination by the DoD of the allowability of IR&D/B&P costs for all of the many small contractors for whom it would be impractical or unduly costly to the DoD to negotiate advance agreements.

33. What are the advantages and disadvantages of greater or lesser Governmental control than that now practiced?

A greater degree of DoD control would have the advantages of a real or apparent reduction of efforts duplicated among contractors, focus of IR&D projects more closely upon recognized problems with the highest DoD priority, closer integration of IR&D projects with DoD funded contract and DoD laboratory projects, and easier "saleability" to skeptics who tend to view the current IR&D program as a "giveaway." The disadvantages of tighter control include greater administrative and overhead cost to both DoD and contractors, loss of the exploratory freedom to which most experts attribute much of the innovative accomplishment of the present program, and loss of much of the stimulus to competition for DoD-funded R&D contracts that is supported by the present program.

A lesser degree of DoD control offers the advantages of still less administrative cost than the present program entails, and of more freedom for competitive pressures to determine the structure and size of the IR&D program. The disadvantages include a possible loss of essential DoD control over total expenditure, an increased hazard of improper or unjustifiable expenditures, and the certainty of stronger attack by opponents of the present IR&D policies.

The predominant view is that worthwhile improvements can be made to the implementation of the present IR&D system, but that its basic alteration is not desirable. (See answers to questions 16, 17 and 29). A corollary to this view is the widely held opinion that the optimum IR&D results per dollar spent are obtained by exercising the least degree of DoD control that is compatible with the protection of basic DoD financial interests. The current IR&D policies are structured on this fundamental premise.

34. What are the advantages and disadvantages of a uniform policy on, or centralized control of, IR&D and B&P for all Governmental agencies?

A uniform policy and centralized control would ensure similar treatment for all companies regardless of which agency they do business with. It would also ensure that the overall objectives determined by top governmental officials were being pursued uniformly by all agencies. A disadvantage might be less flexibility in dealing with the differing needs of various governmental agencies.

35. What resources are needed within the DoD to administer the present degree of control?

The resources required for the degree of control now in effect were a fundamental consideration in choosing both the current IR&D policies and the methods which have been adopted to implement them. Most of the advance agreement negotiations, for example, are centralized in the Army, Navy and Air Force so that only three offices with limited personnel are significantly involved. These three offices have responsibility for most advance agreement negotiations. Negotiations with a few contractors are conducted by DCAS. The formula approach is designed for use by existing and otherwise necessary contracting and audit people in the Services' field organizations. The performance of the technical evaluation, the scope of which has been expanded by recent Congressional legislation, poses manpower and budget problems which are currently being explored by all three Services and ODDR&E.

36. What is the purpose of a technical evaluation of a contractor's IR&D program?

The technical evaluation of contractor programs serves several purposes. It assures that technical work is properly categorized by the contractor for reimbursement purposes. A determination of which work is relevant to the DoD needs is also made, as required by Congress for DoD payments. The technical quality of the contractor's programs must be evaluated for use as one factor in determining the contractor's ceiling, as required by Congress for the DoD payments. The technical evaluation also serves to establish and maintain technical communication between government scientists and engineers and the IR&D investigators in specific areas of research and development and provides the contractor with an independent assessment of his program.

37. What effect should the technical evaluation have?

Contractors who have programs of good technical quality, containing a high percentage of projects that are relevant to DoD needs, should be compensated at a higher rate than those contractors with programs of poor technical quality or lesser program relevance. The technical evaluation provides incentive for contractors to improve their programs for the benefit of future DoD requirements, and also provides a useful degree of guidance by the government.

38. How should the technical evaluation be performed?

The main thrust of the technical evaluation should be toward assessment of the technical quality of the contractors IR&D, emphasizing such matters as scope of the objective, approach, compatibility of contractor resources with the scope and approach, and contractor progress. The evaluation should also determine whether the work is research, development, studies and analysis or not IR&D (for example, training effort, market analysis or survey). Relevancy to a military function is a necessary determination by the DoD evaluator.

Technical evaluations should be performed by experienced, mature and knowledgeable scientific and technical personnel having a broad knowledge of military requirements. It has been agreed by the Services and the DoD, as a cost-effective approach, that the evaluations required for annual negotiations will generally be performed by annual technical plan reviews supplemented by on-site reviews on a 2-3 year cycle. More frequent on-site reviews would require greater resources (people and funds) than are presently involved in evaluation of IR&D. All agencies participating in the IR&D program should participate in the total evaluation procedure. The conduct of a meaningful on-site evaluation requires the commitment of top-level scientific and technical personnel and the expenditure of travel funds. This constitutes a substantial commitment and one which some agencies resist because it tends to detract from their own work. Technical plans can be evaluated in less time and require no travel funds. Consequently, technical plan evaluations necessarily will be relied upon as the primary evaluation medium, with the on-site reviews designed to check the validity of technical plan evaluations.

Standard evaluation forms, now used by all participants, simplify the procedure and minimize the time required.

The use of current year ratings for negotiation of ceilings creates difficulties. Contractors' programs are usually not firm until close to the start of the fiscal year. Thus, evaluations cannot usually be completed until well into the fiscal year. Advance agreements should be negotiated prior to the start of the fiscal year. The options for solving this problem are to use prior year evaluations for current year negotiations, prior year evaluations for current year negotiations with adjustment upon completion of current year evaluations, evaluations based on plans as of six months prior to finalization, or negotiation of advance agreements three to six months into the fiscal year. The first option appears preferable and is the present DoD policy. The second alternative imposes a severe workload on the negotiators at the end of the year when they should be negotiating the next year's agreements and creates uncertainty for the contractors since ceilings can be adjusted after essentially all costs have been incurred. To require the contractors to submit technical plans prior to the end of the internal planning cycle would result in speculative and poorly

defined project write-ups and impose additional administrative costs. The final alternative is inconsistent with the DoD objective of negotiating advance agreements prior to cost incurrence.

39. Should the results of technical evaluations be provided to contractors?

The recently issued revision to ASPR 15-205.35 on IR&D requires that the results of the technical evaluation of a company-submitted technical plan be made available to the contractor. Furthermore, the contractors have repeatedly stated their desire for detailed feedback of evaluation results (e.g. see para 28). They feel this is an independent assessment of their program which provides valuable information on possible unnecessary duplication of effort, relative level of capability, and useful suggestions for improvement. Since the feedback is provided for guidance, and not direction, it does not significantly impact the independence of the contractor's program. In the event the technical rating has a meaningful and traceable impact on the contractor's ceiling, the contractor should be made aware of his overall rating and the general technical comments received from reviewers so he will appreciate why he was rewarded or penalized on technical quality. Providing such feedback to the contractor stimulates DoD raters to do better evaluations. Hence, feedback is beneficial to both the contractors and DoD.

The DoD IR&D Policy Council at its 19 October 1972 meeting decided that the Services should provide oral debriefings to contractors at the end of on-site reviews. In particular, DoD technical personnel performing the evaluation should discuss the overall merits of a contractor's program in sufficient detail to provide him with information concerning the good and poor areas of effort (1) to assist him in improving his program, and (2) to insure that the Services provide well-qualified people to conduct evaluations. In no case should the name(s) of specific raters on a project be provided to the contractor.

40. Are improvements needed in the technical evaluation activity?

The review of IR&D technical plans is becoming quite effective; however, there is a need to achieve more effective technical representation at on-site reviews. A team of 10-15 members at an on-site review can be very effective. Consideration has been given to the development of special lists of invitees for review of specific contractors. It was believed that this method would add to the continuity of reviews and increase the efficiency of the process; however, experience to date indicates that it is better not to have formally organized teams -- some members have proven unsatisfactory and their replacement becomes difficult.

There is also an urgent need for better education of the government's scientific, engineering and procurement communities on IR&D policy and especially on the responsibility of governmental personnel to protect proprietary information obtained by technical review.

41. What are the factors and their relative weights now considered in determining the reasonableness of a contractor's program?

The factors considered by the DoD in reviewing contractor IR&D programs to determine reasonableness of IR&D and B&P costs include a four-year historical review and one to three-year projections of the following data submitted by each contractor:

IR&D Costs	Product Line Information
B&P Costs	Mix of Contracts
Sales	Burdening Procedures
Allocation Base Data	IR&D Technical Efforts
Customer Mix	B&P Technical Information

Other data considered include the following:

Departmental Budgets
General Business Trends
Reliability of Contractor Estimates (Prior-year estimates vs. actuals)
Potential Relationship of Contractor Program to DoD Needs
Technical Evaluation (For each contractor in relation to other contractors)
Ceilings (Prior history of contractor compared with that of competitors)

Use of these factors helps provide some uniformity of approach to determining the reasonable level of governmental participation in contractors' programs. The weights given to the factors identified above vary considerably, however, between Departments, among contractors reviewed, and from year to year. For example, a major change in the mix between government and commercial business has significant impact upon the percentage of support to the total IR&D program provided by DoD funds. Since the mix varies from 100% Government to relatively small percentages of Government business,

each contractor must be considered on an individual basis. Similarly, major changes in total sales volume could inordinately alter on-going programs if an absolute relationship were maintained year by year between IR&D programs and sales. Here again, judgment must be applied to assure both viable IR&D programs and DoD benefits worth the cost.

42. At what times are data available that are needed to determine reasonableness of IR&D and B&P costs?

The requirements are for technical and financial data, and for an expression of the potential relationships (relevancy) of the program to DoD interests.

Financial planning data usually are available from contractors from three to six months prior to the start of each contractor's fiscal year. Firm budget data, however, are generally not available until 30-60 days preceding the start of the fiscal year. These data, as a rule, are available soon enough to permit timely negotiations with the DoD.

Summary statements of IR&D and B&P technical objectives are available at the same time as financial data. The IR&D Potential Military Relationship (PMR) is determined prior to final negotiations by the IR&D Technical Evaluation Group. While these early determinations are somewhat speculative in nature, the after-the-fact PMR review protects the government's interests. B&P potential relationship evaluations are performed by the Tri-Service Negotiation Group.

Technical data (technical plans) are generally not available until after the contractor's internal planning cycle has been completed, and often are not available for two or three months after the start of the performance period. The evaluations require four to six months because of the heavy workload imposed on limited DoD resources. Evaluation results are generally available by the end of the ninth month of the contractor's fiscal year.

In summary, financial data and data on potential relationships of a contractors' IR&D program to DoD needs are a prerequisite to the initiation of negotiations and are generally available as required.

43. Do all companies receive uniform treatment and recovery of IR&D and B&P costs? If not, why not?

Procedurally, all contractors are supposed to receive uniform treatment of their IR&D and B&P costs. The same data are requested from all contractors; the negotiation objectives are derived from the analysis of these data. Recovery is affected by variations among the contractors themselves in such areas as business mix, level of sales, technical excellence demonstrated, and relevancy of program.

Despite procedural intent, all contractors may not, in fact, receive uniform treatment. Each Service considers the factors described above in different ways. For all Services the considerations are basically subjective, and thus the danger of inconsistency is great. No overall guidelines have been developed within or between the Services. It appears, for instance, that the ceilings established in recent years by Navy negotiators have been generally somewhat higher in proportion to proposed programs than those established by Army and Air Force negotiators. Furthermore, even within the Services, treatment has not always been consistent. In the case of the Air Force, for example, the major factor considered in establishing the government's negotiation position has been the previous year's ceiling of the contractor. This policy has tended to perpetuate any inequities already existing.

The negotiation process can result in the IR&D reimbursement being partially based on the effectiveness and tenacity of the contractor's negotiator. A contractor with an excellent technical program, but an agreeable negotiator, may accept a lower relative ceiling than a contractor with a poorer program and a more aggressive negotiator. This may result in cancellation of a portion of the excellent program and expansion of the poor program over a period of years. Quantification (to at least some degree) of the process for determining the government's negotiation position would alleviate the potential for such a problem.

A degree of uniformity in negotiation guidelines and criteria is provided by DPC 90. Joint Service coordination, with representation of the R&D and procurement communities, should be applied in further developing uniform guidelines and criteria for establishing negotiation objectives. Inter-Service agreement must be achieved as to the relative importance of such items as technical performance, the consideration to be given to inflation effects, and the degree of stability desired in company IR&D/B&P efforts. Most important, the DoD should provide specific guidance to the Services as to what the negotiation objectives, policies and criteria are.

44. What information are contractors required or encouraged to divulge in order to recover IR&D and B&P costs? What is its status in the DoD?

Department of Defense Instruction, DODI Number 4105.52, dated 28 June 1960, established the Armed Services Research Specialists Committee to assure that contractors make a proper segregation between their independent research and their independent development programs. The Instruction also required that the committee utilize, where appropriate, the services of other research specialists. According to the DODI, contractors were required to submit copies of a technical plan describing each research and development project and the amount of money budgeted for each project. The information supplied permitted the research specialists to review the programs and assure that development efforts were not classified as research and vice versa and that the scientific information presented was adequate to make further determinations of whether the research and development was related to product lines of the contractor and whether or not the efforts should be supported by the Department of Defense. The requirement for IR&D technical plans, and general guidelines for their format and contents were approved on 9 November 1967 by the Bureau of the Budget and promulgated as BOB approval 22R237.

DODI 5100.66, dated 29 February 1972, superseded DODI 4105.52 and assigned responsibility for technical evaluations to the DoD IR&D Technical Evaluation Group. This Group developed guidelines for contractor submission of technical data which were issued on 4 February 1972 under the authority of BOB approval 22R237. The required data is essentially the same as that previously required. However, with the coupling of evaluations to negotiated ceilings, there has been a significant improvement in the quality of technical presentations in the technical plans.

Information requested for the IR&D Data Bank operation is described in Defense Documentation Center's "IR&D Data Bank Input Manual" (DSAM 4185.9) dated June 1971. In addition to a variety of non-technical inputs such as contact points, project ending date and professional man-years, it also covers up to 30 key words and a narrative which includes technical objectives, approaches and progress. This information was requested of about 35 contractors who agreed to cooperate in the test program. Other contractors have volunteered to participate since the bank was activated. The input from each contractor was solicited by letter from DDR&E using OMB approved Form 22R299. All of the information provided to the data bank is considered company proprietary and is released only to authorized government personnel with an established need to know.

The information provided at the on-site review is presented orally, for the most part, by scientists and engineers conducting R&D tasks under the contractor's program. This information is considered proprietary and can be very detailed technical data, including various approaches and the results of progress on previous scientific efforts. No specific level of detail is demanded by governmental regulation.

At the present time all of the contractors who request an advance agreement provide a copy of their technical plan to NASA. There is no official distribution to the AEC. Most contractors, if not all, would be happy to have the distribution of their plans restricted as much as possible to protect against leakage of proprietary information. It is believed that all of the information contained in the plans and in the data bank, as well as that discussed at on-site reviews, should be considered proprietary because it would be difficult to assure that even the key words or the names of the principal investigators or the amount of funding on a particular task might not be of value to a competitor.

Contractors cannot use DoD security classifications on their IR&D data since the DoD has no rights to the data. Reports from IR&D projects can, however, be classified if DoD classified data is incorporated in the report. If a contractor believes IR&D data should be classified he should protect the data as though it is classified and determine if the DoD desires to obtain rights to the

data. Only when the DoD obtains rights can the data be assigned a DoD security classification. Contractors can obtain classified data for use in their IR&D through "Potential Contractor" programs sponsored by the Services.

The technical and financial information required under B&P has to be presented in adequate detail to permit government negotiators and evaluators to determine whether it has a military relevancy and to provide a basis for establishing a reasonable dollar-ceiling. Generally, contractors have no problem in supplying estimates of B&P expenditures expected for the coming year but most are not able to identify very many of the specific proposals that will ultimately be prepared. It is, therefore, difficult to adequately consider the relevancy of some projects before advance agreement negotiations take place. The relevancy review often has to be performed after the fact. No technical evaluation is done on B&P projects.

Except that a complete list of B&P projects is lacking, the data furnished by contractors prior to negotiations is substantially the same as required for IR&D. That is, historical and projected sales figures are needed with a breakdown showing DoD sales by contract variety (cost type, firm fixed price, incentive, etc.). Historical and projected figures for the base used to allocate B&P costs are required. Historical and projected B&P costs are needed, together with documentation supporting the estimate of future expenditures. Contractor's are encouraged to provide any other data that may be pertinent.

All of these data are presently being obtained for negotiations sponsored by the Air Force and, perhaps to a slightly lesser extent, by the other negotiating activities. The ASPR Committee presently is developing a negotiation procedural document establishing the firm requirements for data for both IR&D and B&P.

45. How can or should the Government safeguard IR&D and B&P information provided by the contractors?

There are several ways in which the government could provide better safeguards than it now does for the IR&D information provided by contractors. Regulations could be prepared which would restrict and control the distribution of IR&D data; greater emphasis could be placed on the "need to know"; and greater effort could be made to promulgate Criminal Statute 18, U.S. Code 1905, which covers penalties faced by U.S. employees who disclose such information. It is believed, however, that this process has never been invoked in connection with a disclosure of company proprietary information.

46. What recourse does the contractor have if proprietary IR&D and B&P information have been divulged?

There is little recourse. There might be recourse if the information were adequately protected by a contract, expressed or implied, which might form the basis for a lawsuit. A lawsuit is now in progress to determine whether an expressed or implied contract is found in the IR&D technical plan.

The government, as a sovereign state, may voluntarily enter into an agreement to indemnify for damages as a result of such disclosures. It should be pointed out, however, that no precedent or specific authority exists for such an action.

47. How do auditors review and monitor IR&D and B&P expenditures?

Although contracting officers are responsible for determining reasonableness and allowability of IR&D, auditors provide input to assist in these matters. In the case of advance agreement negotiations, auditors will review contractors' data for accuracy and to determine whether the classification of IR&D/B&P is proper and in compliance with the Armed Services Procurement Regulation. Where contractors are subject to use of the formula for determining the amount of IR&D/B&P to be allowed, the auditor will audit the contractor's record to make certain the computations are accurate. The auditors also review historical records of costs to determine that IR&D/B&P costs allocated to contracts accurately reflect previously negotiated advance agreements or formula limitations and that such costs are properly classified in the contractor's accounting system.

48. What are major ACO and auditor problems with IR&D and B&P?

The major ACO and auditor problems with IR&D and B&P costs revolve around difficulties encountered in making good judgments with respect to the "reasonableness" of costs claimed by contractors. No generally agreed upon criteria exist with which to judge the reasonableness of IR&D and B&P costs. This difficult judgment has in the past been further complicated by cost principles which required that distinction be made between independent research, independent development, and bid and proposal expense. Such distinctions are almost impossible to make because much IR&D falls near the thin line that separates research from development. Further, much of the technical B&P work is done by the same people who do IR D in the same environment, for closely related purposes. IR&D and B&P, after all, have one common characteristic: both are geared toward placing the contractor in a better position with respect to sales.

Other problems have stemmed from the fact that in the past it was common practice in the "high dollar" cases to set a cost ceiling on IR&D, but not on B&P, thus creating an incentive for contractors to call independent research effort "B&P" or something other than IR&D. In the past contractors have called independent technical effort by many names such as "pre-proposal effort," "pre-design studies," and "technical overhead." This has made the work of ACOs and auditors more difficult.

The revised cost principles on IR&D and B&P (DPC No. 90, dated September 1, 1971) were designed to help overcome some of the problems encountered by ACOs and auditors. While the need for distinguishing between independent research, independent development and bid and proposal has largely been eliminated, it is still necessary to distinguish between the above items and selling cost, manufacturing and production engineering, and other technical overhead items. With ceilings on IR&D and B&P and none on the other overhead items, there exists a strong forcing function for the shifting of over-ceiling IR&D and B&P costs into these other areas. Hence, there still exists a significant cost classification problem for surveillance and resolution.

49. How can the DoD ensure that its personnel are better informed concerning IR&D and B&P?

This is a serious problem in the case of IR&D, and no completely satisfactory solutions have been devised. With the recent issuance of the new ASPR Cost Principles for IR&D, the DoD is undertaking an educational program aimed at both DoD and contractor personnel directly involved in the IR&D program. A broader program to educate DoD technical people in the nature and benefits of IR&D and in the merits and process of performing IR&D technical evaluations has been initiated.

The seriousness of the problem has two aspects. First, many DoD employees seem to believe that effort performed by companies under IR&D is cost-free to the government, and this belief is used to justify a continued pressing of contractors to perform work which a particular agency or contract manager would like to see done but cannot support. Second, there is a failure on the part of some DoD employees to comprehend and respect the proprietary nature of technical information developed in IR&D programs. The ill effects of both these misinterpretations have been discussed earlier in this report.

WHAT ARE THE KEY CRITICISMS OF DOD'S
IR&D PROGRAM, AND HOW VALID ARE THEY?

50. Some critics maintain that IR&D is used to carry out or enhance the support of programs whose funding has been reduced or is controlled at levels below those desired by contractors or System Program Offices (SPOs). They feel that it is impossible to determine the real cost of a defense system or other equipment when a substantial part of the work involved in developing the system or equipment is done as IR&D.

It is reasonable to expect that IR&D programs will relate closely to a contractor's line of business and therefore may provide parallel or alternate technological solutions to problems associated with contracted development work. When such solutions prove to be superior to ones derived from the "main line" of a contracted effort, it would be folly - for all concerned - not to use them. To the extent that

this occurs, the actual costs of a program may become somewhat blurred. The overall effect, however, is believed to be relatively small. Some instances of direct and improper use of IR&D to supplement contracted program efforts undoubtedly occur, but a clearcut separation of such instances from the legitimate interplay noted above is very difficult to establish and document.

51. Some DoD personnel feel that there is not an adequate degree of DoD control over IR&D. They feel that contractors should be constrained to IR&D efforts which the DoD believes to be important.

Such tight control would eliminate the independent and flexible nature of IR&D and much of its resulting creative advantage to the DoD. Those programs for which DoD agencies clearly recognize a need can and should be funded through normal procurement channels and tightly directed.

52. The duplication of effort by many contractors working for the same technical objectives has been criticized.

This duplication provides alternate approaches to the same problem and is thus directly beneficial to some degree. While some of the duplication could be eliminated by exchange of information between contractors, this is not feasible so long as the proprietary nature of IR&D is to be protected. Proprietary secrecy, with some consequent duplication of effort, is inherent in the competitive nature of American enterprise.

53. The dissemination of IR&D information to DoD scientists and engineers has been criticized by some contractors.

Such dissemination is required by law and is a minimal requirement to ensure that the DoD gets its money's worth from IR&D. Congress has the option of eliminating IR&D payments entirely. Some visibility in exchange for the recognition of IR&D as a valid cost is not unreasonable.

54. The DoD does not have full patent and data rights for IR&D results, although it provides fiscal support for IR&D. Contractors thus benefit from what is in effect a form of subsidy.

The actual value of patents obtained in this way is questionable since most of them relate primarily to technology that is largely or solely of interest to the government, and government use of such patents nearly always is granted royalty-free under contract terms. Data rights generally are available to the government on a "For Official Use Only" basis. It is government policy to promote, insofar as feasible, the commercial exploitation of patents derived from government sponsored work, even to the extent of granting exclusive licenses to private companies who will undertake productive exploitation. The IR&D patent practices of the DoD are compatible with this policy.

55. DoD personnel are not as knowledgeable about IR&D as they should be. This can and does lead to duplication by the DoD in-house laboratories or Federal Contract Research Centers (FCRC) of work being done by contractors under IR&D.

This is not so much a valid criticism of IR&D as it is a reason for DoD-technical personnel becoming better informed about what contractors are doing. The means for doing so are available.

56. A lack of strongly centralized control of IR&D by the DoD leads to a disparity among the Services in its administration.

The degree of centralized control desirable is a question still to be resolved. The subject currently is being analyzed.

57. Practices for negotiation of IR&D ceilings for contractors are not consistent within or between the Services.

There is probably some validity to this criticism. A detailed study of this subject is in progress.

APPENDIX A

Results of Industrial Survey

This survey, conducted in May and June 1972, was undertaken to gather information from industry in support of the report "A Review of IR&D - 1972." Senior engineering, marketing, financial and program management executives of 30 companies and major divisions of companies with DoD business were individually interviewed on-site. The companies are listed in Table I. During each of the interviews, in addition to general discussions of IR&D matters, the company executives were asked to respond to specific questions in a questionnaire developed by the Working Group. The respondents were in all cases assured that their individual replies would be held in confidence, with only composite information from all respondents (or from industry groups such as aerospace, electronics, etc.) to be published. With this assurance, the replies received in virtually all cases were copious and completely frank. It was evident to all of the DoD interviewers that the industrial executives interviewed were intensely interested in IR&D, held strong views on it, and were eager to express them.

The questions asked in the survey and the cumulative replies received are presented in this appendix. The replies are numbered in order of the frequency of their occurrence, with No. 1 being the most frequent, No. 2 the next most frequent, etc. Only replies which occurred with substantial frequency are reported.

Q. What is the overall value of IR&D to your company?

- A. 1. Helps greatly to establish and maintain necessary technology base.
- 2. Enhances competitive position.
- 3. Helps in overall company management.
- 4. Enables company to do a better job on contracts.
- 5. Generally benefits the nation and therefore us.

Q. How might benefits be maximized?

- A. 1. Reduce restrictions on kinds and amounts of IR&D allowable.
2. Increase communication within DoD of IR&D information and results.

Q. How do you rank the importance to your company of the following reasons for conducting IR&D?

- A. 1. Develop new company products/techniques.
2. Provide technical bases for winning government R&D contracts.
3. Improve current products/techniques.
4. Improve technical competence of R&E personnel.
5. Reduce product costs.
6. Other.

Q. Historically, what have been the most important factors in advancing the technical capabilities of your company?

- A. 1. Management willingness to use company resources in technical pursuits.
2. Good hiring practices and employment stability.
3. Technically challenging contracts.

Q. What role has IR&D played in this?

- A. 1. Opportunity to develop technical capability and technology base.
2. Source of new ideas and concepts leading to contracts and entry to new fields.

Q. What percentage of your IR&D projects result in Contracts? Patents?

A.	<u>Responses</u>		
	<u>Mean</u>	<u>Median</u>	<u>Largest Group</u>
1. Contracts	40-50%	40-50%	30-40%
2. Patents	20-30%	0-10%	0-10%

Q. Do you support with company money any IR&D effort beyond the ceiling levels accepted by the DoD for reimbursement?

- A. 1. Yes (virtually all contractors do).
 2. Company could not compete without doing so.

Q. Rank the desirability of the following approaches to providing reimbursement for industrial R&D.

- A. 1. Use the current DoD approach (negotiated IR&D advance agreements).
 2. Provide tax incentives.
 3. Provide increased profit percentage on cost reimbursement contracts.
 4. Use standard formula for all companies.
 5. Directly fund grants based on proposals submitted.
 6. Provide for direct or deferred charges in the contract (AEC approach).

(Current DoD approach is favored by a large margin over the next in rank.)

Q. In determining the annual budget level for IR&D, what parts of your company organization play the major roles?

A. Primary Role: Executive Offices

Supporting Role: 1. Engineering

2. Financial Management

3. Marketing

4. Program Management

(Company financial policy, marketing needs and engineering capabilities all are major factors in determining level.)

Q. In determining projects to be performed what parts of your company organization play the major roles?

A. Primary Role: Engineering

Supporting Role: 1. Marketing

2. Executive Offices

3. Program Management

Q. What are the most important criteria for selection?

A. 1. Technology needed to meet known or strongly anticipated specific engineering requirements.

2. Probability of success/payoff.

3. Possibility of technical breakthrough.

Q. How would you rank information sources in respect to their direct value in planning IR&D?

A. 1. Personal contacts with customers/symposia/seminars.

2. Government planning documents; operational requirements.

3. Internal company planning and forecasting.

4. Other sources.

(Personal contacts are favored choice by large margin)

Q. What percentage of the projects listed in the IR&D Technical Plan do you generally carry out?

A. Median Reply, 80-90% - Largest Group, 80-90%

Q. What are most commonly encountered reasons for changes?

- A. 1. Technical results very promising or disappointing.
2. Changed company marketing/business priorities.

Q. Who initiates and who approves the changes?

<u>Initiates</u>	<u>Approves</u>
1. Engineering	1. Engineering
2. Executive Offices	2. Executive Offices

Q. What has been the distribution pattern of your completed projects in terms of their duration?

	<u>%</u>
A. Less than 1 year	16
1-2 years	34
2-5 years	40
5-10 years	9
More than 10 years	1

Q. What is the usual output?

- A. 1. Prototype hardware
2. Reports/documents/data

Q. Are there major weaknesses in the current IR&D technical evaluation procedures?

A. Yes - 70% No - 30%

Q. What are the principal weaknesses you see?

- A. 1. Poorly prepared/selected evaluators at on-site surveys.
2. Insufficient time and effort applied to make effective evaluation feasible.
3. Relevancy determinations are too rigid.
4. Contractors should be given more complete debriefing on evaluation results. (Feedback)
5. Technical plans have become an expensive literary exercise and are not a valid basis for evaluation.

(Numerous other criticisms were voiced by small numbers of the executives questioned.)

Q. Do you consider the end results of the IR&D technical evaluations generally to have been reasonable and fair to you?

A. Yes - 80% No - 20%

(Despite objections to the mechanics of the evaluation process.)

Q. Are there major weaknesses in the current approach to IR&D negotiations?

A. Yes - 90% No - 10%

Q. What are the principal weaknesses you see?

- A. 1. No firm criteria for negotiation; Government negotiators interested almost solely in obtaining lowest possible ceiling; company under extreme duress to accept whatever is offered.
2. Insufficient emphasis on technical rating of contractors' programs; negotiations provide no reward or motivation for technical excellence in program.

(Numerous other criticisms were voiced by small numbers of the executives questioned.)

Q. Do the implementation actions by lower DoD echelons accurately reflect present DoD policy?

A. Yes - 35% No - 65%

Q. How do they deviate?

- A. 1. Working level personnel excessively cautious and restrictive.
2. Contracting officers pressure contractors to support their contract with IR&D.
3. Negotiators insist on cost sharing.

Q. Would you like to see anything changed in current DoD policy on IR&D?

Yes - 69% No - 31%

Q. What are the principal changes you would suggest?

- A. 1. More freedom for normal business competitive pressures to determine acceptable size and nature of program.
2. More liberal interpretation of relevancy at least to "U.S. Government" rather than DoD alone.

(Very large numbers of other suggestions were voiced, each by one or a few of the respondents)

COMPANIES INTERVIEWED

AVCO

McDONNELL -DOUGLAS

BOEING

- DOUGLAS AIRCRAFT DIV.

- COMMERCIAL AIRCRAFT

- ASTRONAUTICS DIV.

- AEROSPACE DIVISION

MOTOROLA

GENERAL DYNAMICS

NORTH AMERICAN ROCKWELL

G.E. SPACE DIVISION

- SCIENCE CENTER

GRUMMAN AEROSPACE

- ROCKETDYNE

HUGHES AIRCRAFT

- L. A. DIVISION

- AIRCRAFT COMPANY

- CORPORATE OFFICES

- RESEARCH LAB.

NORTHROP CORPORATION

LITTON SYSTEMS

PERKIN-ELMER CORP. SYSTEMS

- DATA SYSTEMS DIVISION

RAYTHEON COMPANY

- NAV., GUIDANCE AND
CONTROL DIVISION

RCA SYSTEMS

LOCKHEED AIRCRAFT

TEXAS INSTRUMENT COMPANY

- MISSILES AND SPACE DIV.

TRW SYSTEMS

- CALIFORNIA DIVISION

UNITED AIRCRAFT CORP.

LTV

- CORPORATE OFFICES

MARTIN MARIETTA CORP.

- PRATT AND WHITNEY

WESTINGHOUSE